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## **SAR OBSERVATIONS IN THE GULF OF MEXICO**

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### **1. INTRODUCTION**

The Gulf of Mexico (GOM) exhibits a wealth of energetic ocean features; they include the Loop Current with velocities of about 2 m/s and strong shear fronts, mesoscale eddies, double vortices, internal waves and the outflow of the "Mighty Mississippi" river. These energetic features can have a strong impact on the economies of the states surrounding the Gulf. Large fisheries, oil and gas production as well as pollution transport are relevant issues. These circulation features in the Gulf are invisible to conventional IR and visible satellite imagery during the Summer months due to cloud cover and uniform surface temperatures. SAR imagery of the Gulf does penetrate the cloud cover and shows a rich assembly of features there year-round. Below are preliminary results from GOM SAR imagery taken by SEASAT in 1978 and by the AIRSAR program in 1991.

### **2. SEASAT IMAGERY**

A search at JPL archive for SAR data (optically processed) along the edges of the Loop Current yielded images with a rich array of features. A number of these images were selected and digitally processed. Here we will look at some of them with an emphasis on circular doughnut like features and their comparison with Shuttle photography of what appears to be the same

features. These features have a relatively dark center surrounded by a bright "doughnut". Their spatial scales vary but are generally of the order of 10 km. They have been observed before (Fu and Holt, SEASAT Views Oceans and Sea Ice With SAR, JPL publication 81-120, 1982) and described as local atmospheric downdrafts with the dark center as a tropical rain cell. Indeed recent in-situ measurements by Trizna at NRL show the inhibiting effect of rain on radar returns confirming the above interpretations of these features.

Large areas in these images are relatively bright or dark suggesting large areas with either high or low radar crosssections. The boundary between these areas is a front, most likely the edge of the Loop Current. These SEASAT images show the power of SAR to monitor energetic features in the GOM during the Summer months when other remote sensors are practically blind. Thus the modulation of waves is a useful means for observing energetic ocean features under all-weather conditions.

#### **AIRSAR IMAGERY OF THE GULF OF MEXICO**

During May 19, 1991 we obtained AIRSAR imagery from the JPL/NASA DC-8 in conjunction with in-situ data taken from the RV Tommy Munro and tracked drifter data. A small number of SAR images were processed by the synoptic processor; they do, however, show some interesting characteristics. During the period of the experiment high winds and waves were prevalent. The DC-8 flew a box pattern, off the shelf over the Northern GOM, that included two equivalent passes with a 45 minute time difference between them. These passes were to the West and in one of them a linear bright front was clearly seen while in the other the front was missing. The presentation will include wind data from the RV Munro that was in the same area at the time plus a discussion of different mechanisms for the generation of a linear front. This work is still in progress and I will present as much data as will be available at the time of the presentation.